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EXPLOSIVE FLASK FOR ILLUMINATING DETONATION PHENOMENA

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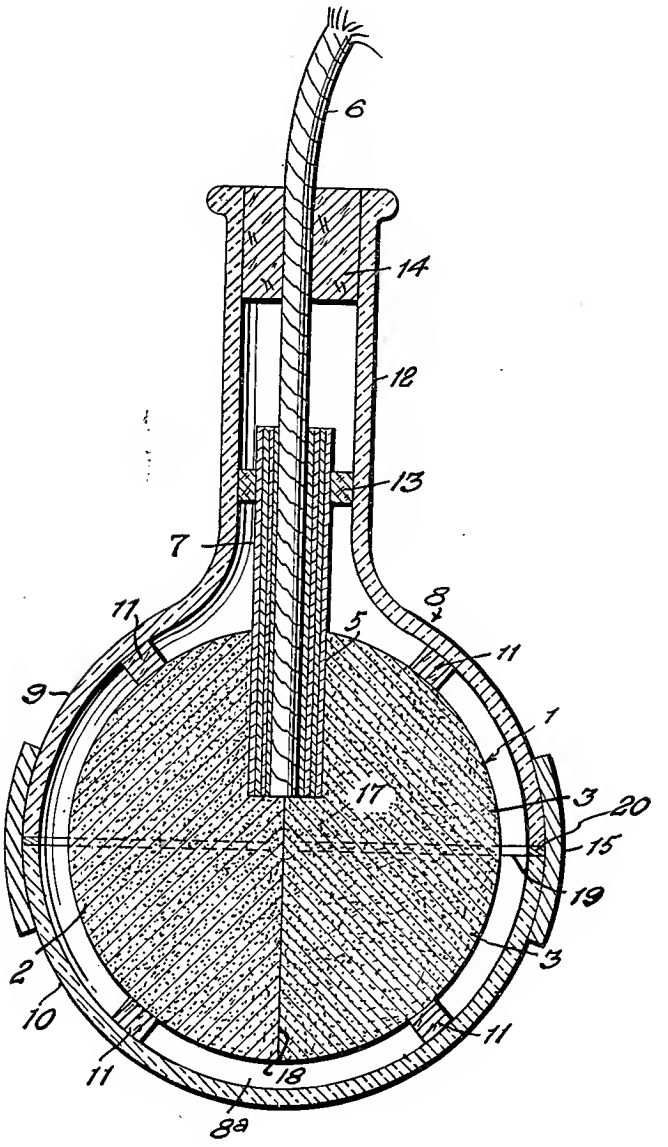

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EXPLOSIVE FLASK FOR ILLUMINATING DETONATION PHENOMENA

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3 Claims. (Cl. 102—87)

In our application Serial Number 708,390, filed November 7, 1946, now Patent 2,653,073, dated September 22, 1953, of which the present application is a division, we have disclosed a method of and apparatus for photographing detonation phenomena of explosive charges by the light of the flash produced by a second charge of explosive detonated in timed relation with the charge under investigation. One of the component parts of the apparatus disclosed and claimed in the aforesaid parent application is a flask for mounting the second or illuminating charge within a body of gas having positive shock wave properties and for positioning the illuminating charge in desired or optimum position with respect to the charge whose properties are under investigation.

It is therefore, the principal object of our invention to provide a flask or container of the aforesaid type which may be easily and quickly assembled about an illuminating explosive charge to hold the charge in symmetrically spaced relation with the walls of the flask, to facilitate the filling of the space between the charge and walls of the flask with a gas having positive shock wave properties, and to maintain the gas undiluted until the flask is used.

Other objects and advantages of the invention will be apparent from a study of the following description in connection with the accompanying drawing wherein the single figure shows a central axial cross section through the completed flask.

Referring in detail to the drawing the charge **1** is shown as two hemispherical halves **2** and **3** fitting together along a normally vertical plane **18** perpendicular to the plane of the figure. Each half has a semicylindrical radial groove which, when the halves are in mating relation, form a cylindrical channel or bore **5** extending nearly to the center of the spherical charge.

The flask **8** is formed of a transparent or translucent substance such as glass, and is divided into an upper portion **9** having a neck **12**, and a lower hemispherical portion **10**. As shown, the two portions are separable in an equatorial plane **19** normal to plane **18** and the plane of the figure. The two halves **9** and **10** are united by any suitable means such as collodion or a length of "Scotch tape" **15**. If desired, gasket compound or other suitable sealing material **20** may be used between the meeting surfaces to effect a gas-tight joint.

As shown, the radius of the spherical charge **1** is materially less than the inside radius of the flask and spacers **11** of suitable material such as cork, having a thickness equal to the difference of the two radii, are regularly positioned between the charge and flask to maintain the two in fixed relation. The space **8***a* thus formed is adapted to be filled with a gas, such as argon, having positive luminous shock wave properties. Split plugs **13** and **14** are positioned within the neck **12** and collectively define a passageway by which a length of fuze cord **6**, such as "primacord," is led from the flask. As shown, this fuze cord has a portion of its length within the flask wrapped with a length of metallic foil **7**, such as lead,

to form a cylinder substantially equal in diameter to that of bore **5**. The cylindrical wrapping may conveniently extend through plug **13**. It will be noted that the wrapping **7** and the fuze cord terminate within charge **1**, closely adjacent the center thereof. By this construction it is assured that the charge **1**, is initiated at the center thereof.

In assembly, spacers **11** may be secured by adhesive in proper positions within sections **9** and **10**. Thereafter the fuze cord **6**, its foil wrapping **7**, and plugs **13** and **14** are positioned within neck **12** and the charge **1**, with its two halves **2** and **3** in assembled relation, are positioned as shown. The lower hemispherical flask portion **10** is then placed in position and the two portions are secured together by tape **15**. The entire flask is then placed within a desiccator, with opening **17** uncovered, and after exhaustion of the air therein, argon gas is admitted to fill the space between the flask and charge at atmospheric pressure. The opening **17** is then sealed with a drop of collodion. In order to mimimize leakage of gas, the flask may be left within the desiccator, filled with argon until ready for use.

In a flash bulb successfully and extensively used for the described purpose, the charge consisted of 200 grams of a sphere of cast "pentolite" 2½" in diameter. The flask was of approximately 200 cc. capacity, and a space of about 3/16" radial dimension was provided between the charge and flask. The end of the fuze cord terminated about ¼" above the center of the spherical charge. Lead foil 1/32" in thickness was used to wrap the end of the fuze cord. By this construction the detonation wave from the centrally-initiated spherical charge produces simultaneously all over the charge surface an intensely luminous shock wave in the argon surrounding the charge. The approximate duration of the light is the time required for the blast wave to travel the distance between the surface of the charge and the wall of the flask. This time, in the flask described, is about 0.8 microsecond and gives a photographic intensity of the order of 10^3 candlepower. The duration time of the flash can therefore be varied by varying the radial spacing between the charge and flask. Any asymmetry in the detonation wave will also increase the duration time. However, this is undesirable since the duration time cannot be determined or controlled and if excessive will produce blurring and indistinctness of detail in the resulting photograph. It is therefore rather important that the end of the fuze cord be carefully located just above the center of the charge, and that the fuze cord be shielded as shown to insure initiation of the charge occurring only at the end of the cord within the charge, that is, at substantially the center of the charge.

By the invention just disclosed, an illuminating flask may be readily prepared. The flask is relatively inexpensive and easy to position in proper relation with the explosive charge to be photographed.

Having now fully disclosed the invention, what we claim and desire to secure by Letters Patent is:

1. A flash bulb comprising a generally spherical thin-walled flask of transparent shatterable material having an integral tubular neck portion extending therefrom along a radius of said flask, said flask being divided into two parts on an equatorial plane normal to said radius, a solid, unencased spherical detonating explosive charge within and of lesser diameter than said flask, spacers positioned between said flask and charge to hold the latter centralized within said flask, detonating fuze cord means having one end anchored within a radial bore in said explosive charge and extending from substantially the center of said charge through said neck portion to the exterior of said flask, shielding means of metallic foil within said neck portion and extending about said fuse

cord means, a body of gas having positive luminous shock wave properties filling the space between said explosive charge and flask, and sealing means securing said flask parts together in gas-tight relation.

2. A flash bulb for producing a high intensity flash of short duration, comprising a closed transparent generally spherical container of frangible light-permeable material, a spherical unencased detonating explosive charge within said container having a diameter less than the diameter of said container, means mounting said charge in concentric relation with said container to form a space of uniform radial dimension between said charge and container and shielded fuse means for initiating said charge at the center thereof, said fuse means comprising a length of detonating fuse cord extending from substantially the center of said charge to the exterior of said container.

3. In a flash bulb of the type described, a transparent generally spherical flask having an integral tubular neck, said flask being divided into two portions in an equatorial plane normal to the axis of said neck, a spherical explosive charge in said container and of less diameter than said container, said charge being divided into two hemispheres in a plane containing the axis of said neck, there being channels in said hemispheres forming a radial passage when said hemispheres are in assembled mating relation, spacers between said charge and flask holding said charge in concentric relation with said flask, a length of explosive fuse cord having one end extending into said passage and terminating at the approximate center of said sphere, said cord extending through said neck to the exterior of said flask, sealing means between said cord and neck, means uniting the portions of said flask in gas tight relation, a metallic shield about that portion of said cord within said sphere, and argon gas filling the space between said charge and flask.

References Cited in the file of this patent

UNITED STATES PATENTS

318,761	Letson et al.	May 26, 1885
1,276,402	Parkinson	Aug. 20, 1918
2,008,235	Williams	July 16, 1935
2,578,726	Moore	Dec. 18, 1951
2,603,155	Clarke et al.	July 15, 1952